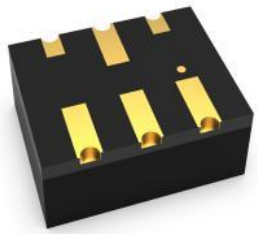
Descriptions

0.5A Non-isolated Regulator



RoHS

CE Report EN62368-1

UKCA Report BS EN62368-1

Features

- Ultra-small, ultra-thin DFN package(9.00 x 7.00 x 3.10mm)
- Operating ambient temperature range: -40℃ to +105℃
- High efficiency up to 92%
- No-load input current as low as 0.1mA
- Output short-circuit protection

Applications

- industrial control
- instrumentation
- electric power

Selection Guide

Certification	Part No.	Input Voltage (VDC)*	Output		Full Load Efficiency (%) Min./Typ.	Capacitive Load (μF)Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max./Min.		
EN/BS EN	DNKMT0.5-7803V2	24 (4.5-36)	3.3	500	89/79/71	680
		12 (7-32)	-3.3	-300	80/82/71	470
	DNKMT0.5-7805V2	24 (6.5-36)	5	500	91/83/78	680
		12 (7-31)	-5	-300	78/78/71	470
	DNKMT0.5-78X6V2	24 (8-36)	6.5	500	91/85/81	680
		12 (7-28)	-6.5	-250	80/79/73	470
	DNKMT0.5-7809V2	24 (12-36)	9	500	92/90/86	680
		12 (8-27)	-9	-200	82/82/77	470
	DNKMT0.5-7812V2	24 (15-36)	12	500	92/91/86	680
		12 (8-24)	-12	-150	81/83/79	470
	DNKMT0.5-7815V2	24 (18-36)	15	500	91/91/87	680
		12 (8-21)	-15	-150	80/81/84	470

Note: * For input voltage exceeding 30 VDC, an input capacitor of 22uF/50V is required.

Specifications

Product characteristics	Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Specifications	No-load Input Current	Nominal input voltage		--	0.1	--	mA
	Reverse Polarity at Input			Avoid / Not protected			
	Input Filter			Capacitance filter			
	Ctrl①	Module on		Ctrl pin open② or pulled high(TTL 2.5~5VDC)			
		Module off		Ctrl pin pulled low to GND(-Vo)(0~0.6VDC)			
		Input current when off		--	240	--	uA
Output Specifications	Voltage Accuracy	Full load, input voltage range	3.3 VDC output	--	±2	±4	%
			Others	--	±2	±3	
	Linear Regulation	Full load, input voltage range		--	±0.2	--	
	Load Regulation	Nominal input voltage, 10% -100% load		--	±0.4	--	
	Ripple & Noise③	20MHz bandwidth, nominal input voltage, full load		--	20	45	mVp-p
	Temperature Coefficient	Operating temperature -40℃ to +105℃		--	±0.02	--	%/℃
	Transient Response Deviation	Nominal input voltage, 25% load step change		--	50	120	mV
	Transient Recovery Time			--	0.2	0.8	ms
	Short-circuit Protection			Continuous, self-recovery			
General Specifications	Operating Temperature	See Fig. 1		-40	--	+105	℃
	Storage Temperature			-55	--	+125	
	Storage Humidity	Non-condensing		5	--	95	%RH
	Reflow Soldering Temperature			Peak temperature ≤245℃, duration ≤ 60s max. over 217℃. Also refer to IPC/JEDEC J-STD-020D.1.			
	Switching Frequency	Full load, nominal input voltage		--	2.0	--	MHz
	MTBF	MIL-HDBK-217F@25℃		9152	--	--	k hours
	Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1		Level 3			
	Pollution Degree			PD3			
Mechanical Specifications	Case Material	Black epoxy resin; flame-retardant and heat-resistant(UL94 V-0)					
	Dimensions	9.00 × 7.00 × 3.10mm					
	Weight	0.58g(Typ.)					
	Cooling Method	Free air convection					

Notes:

①The positive output ctrl pin voltage is referenced to input GND; Negative output ctrl pin voltage is referenced to -Vo.

②The "parallel cable" method is used for ripple and noise test.

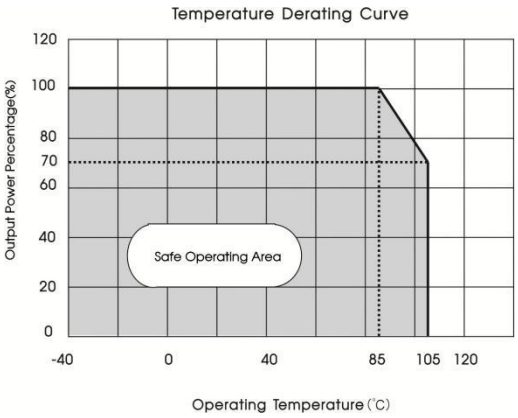
Electromagnetic Compatibility (EMC)

Electromagnetic Compatibility (EMC)	Emissions	CE	CISPR32/EN55032	CLASS B (see Fig. 3-② for recommended circuit)	
		RE	CISPR32/EN55032	CLASS B (see Fig. 3-② for recommended circuit)	
	Immunity	ESD*	IEC/EN 61000-4-2	Contact ±6kV	perf. Criteria B
		RS	IEC/EN 61000-4-3	10V/m	perf. Criteria A
		CS	IEC/EN 61000-4-6	3Vr.m.s	perf. Criteria A
		EFT	IEC/EN 61000-4-4	±1kV (see Fig. 3-① for recommended circuit)	perf. Criteria B
		Surge	IEC/EN 61000-4-5	line to line ±1kV (see Fig. 3-① for recommended circuit)	perf. Criteria B

Note: * The static level of the Ctrl & Trim pin is ±2kV when they are not connected to external devices; It is suggested to connect an external capacitor (105k/50V) from Ctrl to GND/-Vo to meet ESD (±6kV) of the Ctrl pin, and to connect a varistor (22V/30A) from Trim to GND/-Vo to meet ESD(±6kV) of the Trim pin.

Characteristic Curve

3.3V/5V/6.5V output



9V/12V/15V output

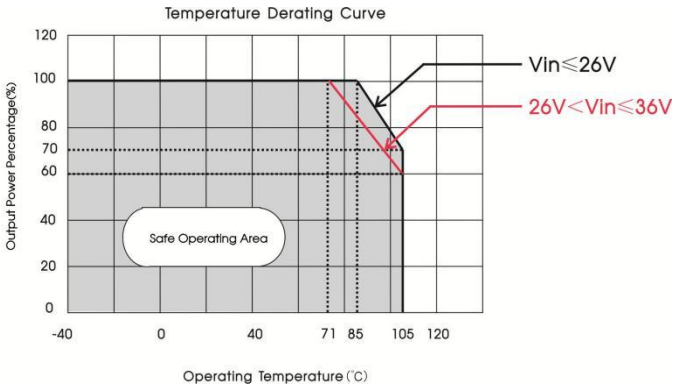
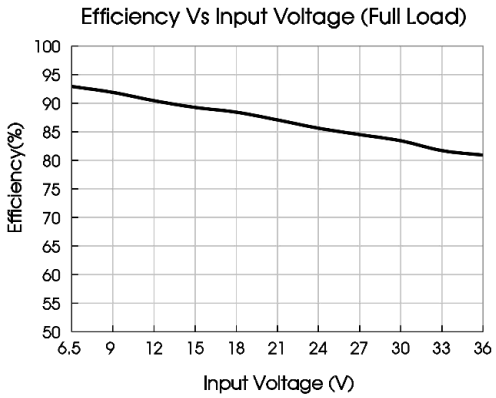
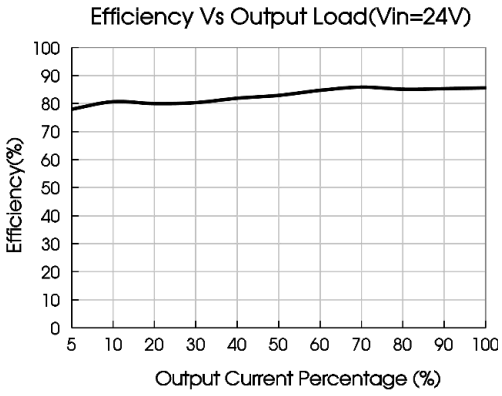


Fig. 1





DNKMT0.5-7805V2

Design Reference

1. Typical application

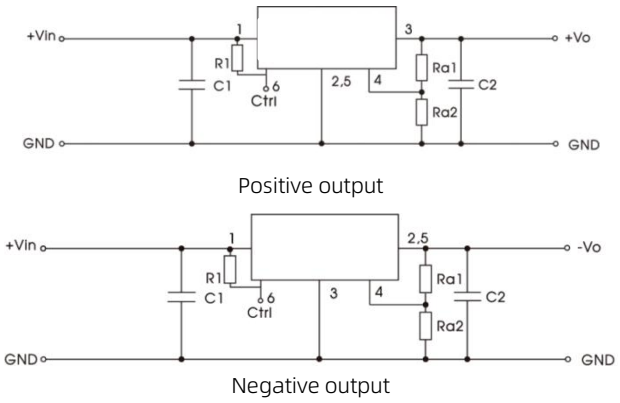


Fig. 2 Typical application circuit

Table 1

Part No.	C1 (ceramic capacitor)	C2 (ceramic capacitor)	R1
DNKMT0.5-7803V	10μF/50V	22μF/10V	100kΩ
DNKMT0.5-7805V		22μF/10V	
DNKMT0.5-78X6V		22μF/16V	
DNKMT0.5-7809V		22μF/16V	
DNKMT0.5-7812V		22μF/25V	
DNKMT0.5-7815V		22μF/25V	

Notes:

1. The required C1 and C2 capacitors must be connected as close as possible to the terminals of the module;
2. Refer to Table 1 for C1 and C2 capacitor values. For certain applications, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead;
3. Converter cannot be used for hot swap and with output in parallel;
4. 100k is recommended for R1 when CTRL function is used. If the Ctrl function is not needed, the Ctrl pin can be shorted to the VIN pin without R1.

2. EMC compliance circuit

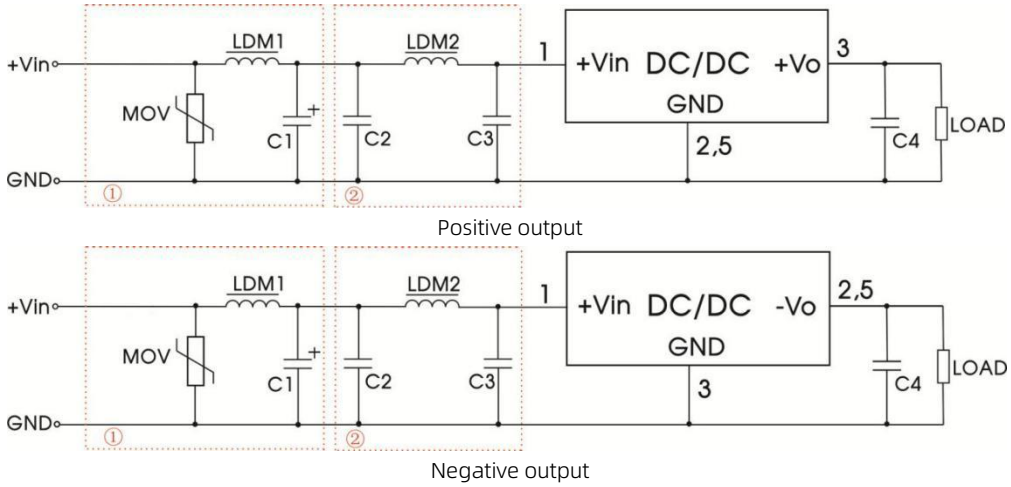


Fig.3 Recommended compliance circuit

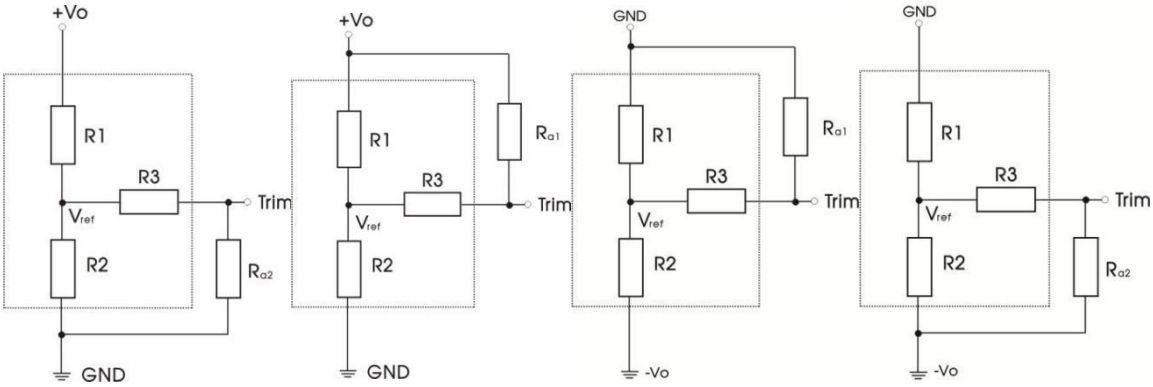
Part No.	MOV	LDM1	C1	C2	LDM2	C3	C4
DNKMT0.5-7803V2 (Positive output)	S20K30	82μH	680μF /50V	10μF/50V	10μH	0.47μF/50V	22μF/10V
DNKMT0.5-7803V2 (Negative output)					22μH	/	
DNKMT0.5-7805V2					10μH	/	
DNKMT0.5-78X6/09V2					10μH	1μF/50V	22μF/16V
DNKMT0.5-7812/15V2					22μH	0.47μF/50V	22μF/25V

Notes: For EMC tests we use Part ① in Fig.3 for immunity and part ② for emissions test. Selecting based on needs.

3. Trim Function for Output Voltage Adjustment (open if unused)

1. Positive output application: connect trim resistor to GND/Vo respectively for adjusting up/down;

2. Negative output application: connect trim resistor to GND/-Vo respectively for adjusting up/down.



Positive output trim up | Positive output trim down | Negative output trim up | Negative output trim down

Fig. 4 Circuit diagram of Vtrim up and down (dashed line shows internal part of module)

Calculating Trim resistor values:

Trim up: $R_{a2}=\frac{aR_2}{R_2-a}-R_3,\ a=R_2//(R_3+R_{a2})=\frac{V_{ref}}{V_o'-V_{ref}}R_1$

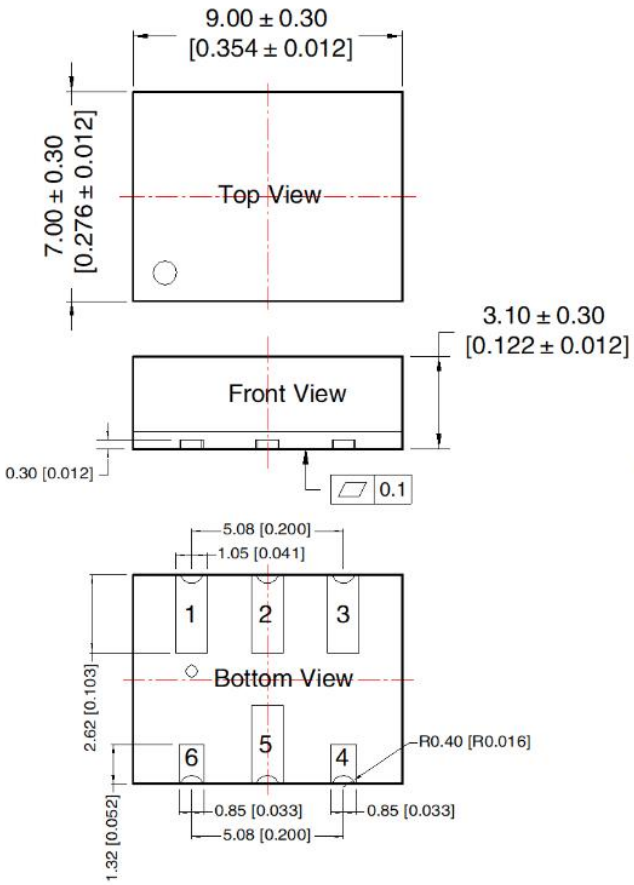
Trim down: $R_{a1}=\frac{aR_1}{R_1-a}-R_3,\ a=R_1//(R_3+R_{a1})=\frac{V_o'-V_{ref}}{V_{ref}}R_2$

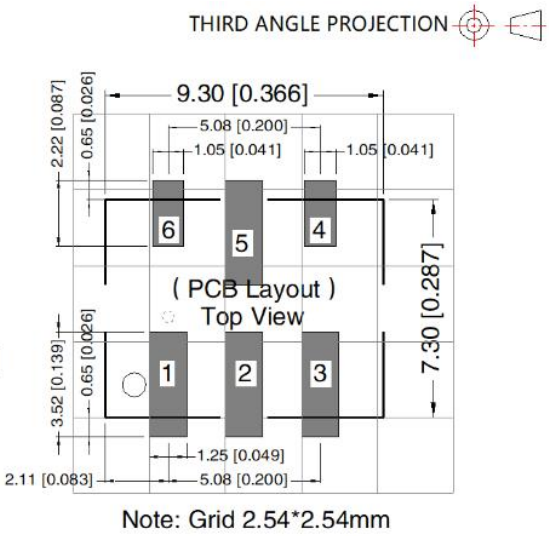
Vout(V)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
3.3	47	15	82	0.8
5	36	6.875	36	0.8
6.5	47	6.596	36	0.8
9	75	7.318	47	0.8
12	120	8.571	51	0.8
15	100	5.634	36	0.8

Table:

Vout nom.	±3.3VDC		±5.0VDC		±6.5VDC		±9.0VDC		±12VDC		±15VDC	
Vout adj.	Ra1	Ra2	Ra1	Ra2	Ra1	Ra2	Ra1	Ra2	Ra1	Ra2	Ra1	Ra2
2.97	221k											
3.63		34k										
4.5			236k									
5.5				20k								
5.85					329k							
7.15						22k						
8.1							562k					
9.9								19k				
10.8									948k			
13.2										29k		
13.5											811k	
16.5												17k

Dimensions and Recommended



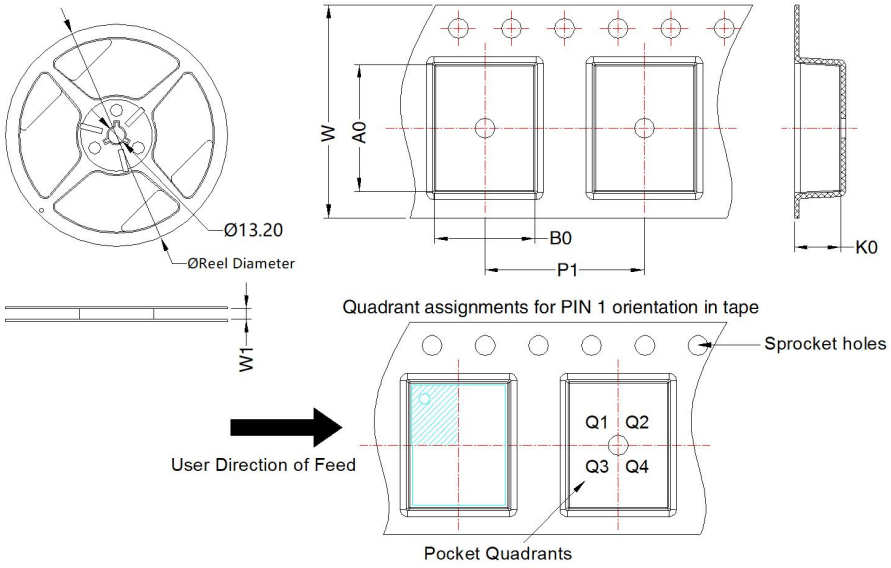


Note: Grid 2.54*2.54mm

Pin–Out		
Pin	Positive output	Negative output
1	+Vin	+Vin
2	GND	–Vo
3	+Vo	GND
4	Trim	Trim
5	GND	–Vo
6	Ctrl	Ctrl

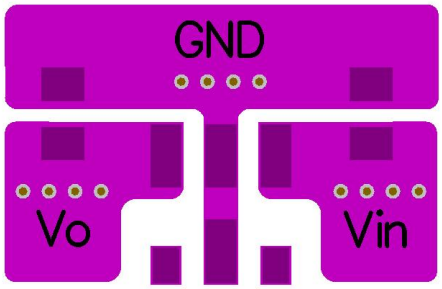
Note:
Unit: mm[inch]
General tolerances: ± 0.10[± 0.004]

Tape/Reel packaging



Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
DFN 7x9	7	400	180.0	16.4	9.56	7.56	3.5	12.0	16.0	Q1

Temperature Rise Test PCB Layout



Notes:

1. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.